Integrating Adaptive Environmental Management into Dredging Projects

CEDA Position Paper
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Central Dredging Association

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Definition - Adaptive Management

- decision framework facilitating flexible decision-making
- to be refined for future uncertainties, when understanding effect of current and future management actions.
- developing and implementing a management plan, defining project goals and periodically reviewing progress,
- in response to the outcomes of (environmental) monitoring, implementing corrective actions and refining of plan, as needed.

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Why this CEDA paper?

- Projects often permitted , after EIA, with conditions and thresholds based on best understanding.
- Yet uncertainties exist about effects and responses by nature – better or worse.
- Need for less rigid management structure recognised.
- Gives information on objectives, suggestions and recommendations how to apply adaptive processes.

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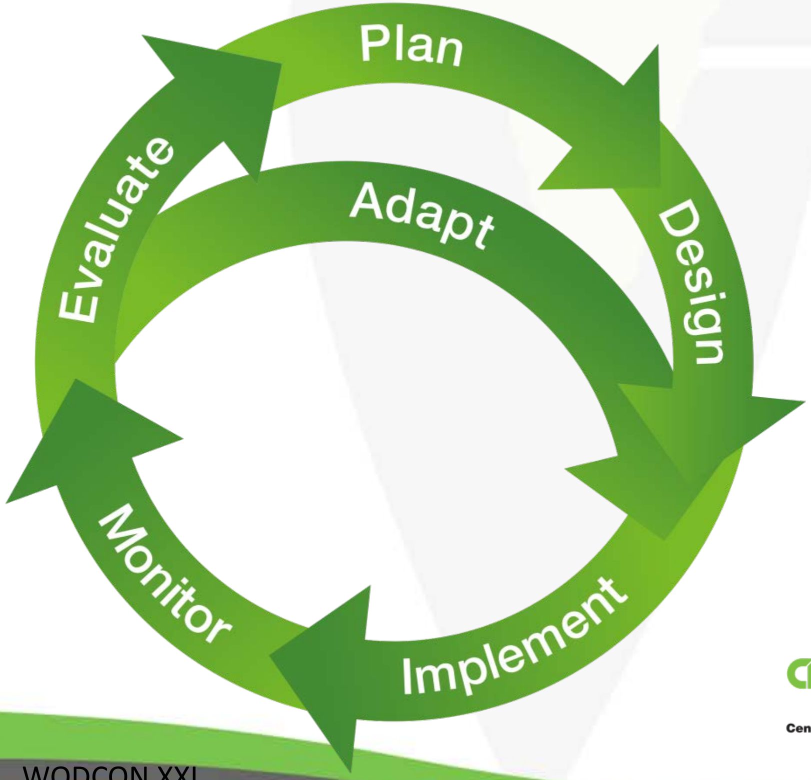
What is AM, and what can it deliver

- Decision framework for decision making in response to uncertainties, leading to AM plan, based on monitoring.
- Relatively formal process, towards high efficiency while aiming for good ecological state.
- 5 steps:



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What is AM, and what can it deliver

Project Consideration	Benefit	Disadvantage
Environmental	Enables a project with uncertainties to go ahead. Effective method of protection for the environment, especially when tiered management approach.	In rare instances, may be used as an "excuse" for poorly conceived design or project implementation. Dealing with uncertainties takes more time and effort.
Legal / Permitting	May allow projects to proceed with licence while still uncertainties on sensitive receivers.	May conflict with prevailing laws, when based on precautionary principle.
Effort and economics	Case-specific solution with initially more effort, but possibly lower total effort and cost. High attention level advantageous for overall result.	Uncertainty on effort complicates exact advance budgeting. Needs allowance for provisional funds. Might delay project.
Contractual	Allowance for flexibility reduces potential for conflicts.	Increased effort in contract management, for risk sharing
Social	Stakeholder trust may be improved by transparent process.	May be perceived to justify worse project outcomes. May be reluctance to reduce scope.

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Implementing AM

Management considerations

- Not working from precautionary approach – worst case scenario
- Working on case-specific approach, focus on sensitivity of environmental receptors
- Management Organisation requires
  - temporary more intensive monitoring-evaluation-assessment,
  - higher budget and resource requirements for MEA,
  - mechanism to deal with variable effort based on requirements,
  - mechanism to deal with changing total costs,
  - cross-sectoral project management skills
  - flexibility for a differing implementation timeframe

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Implementing AM (continued)

Management considerations

- Management structure to be communicated openly
  - Specific thresholds for effect
  - Tiered levels for action
  - Monitoring methodology (including frequency)
  - Review process for adjustments
  - Required response times
  - Decision making process
- Defined in Adaptive Management Plan
- Early Contractor Involvement advised

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Implementing AM (continued)

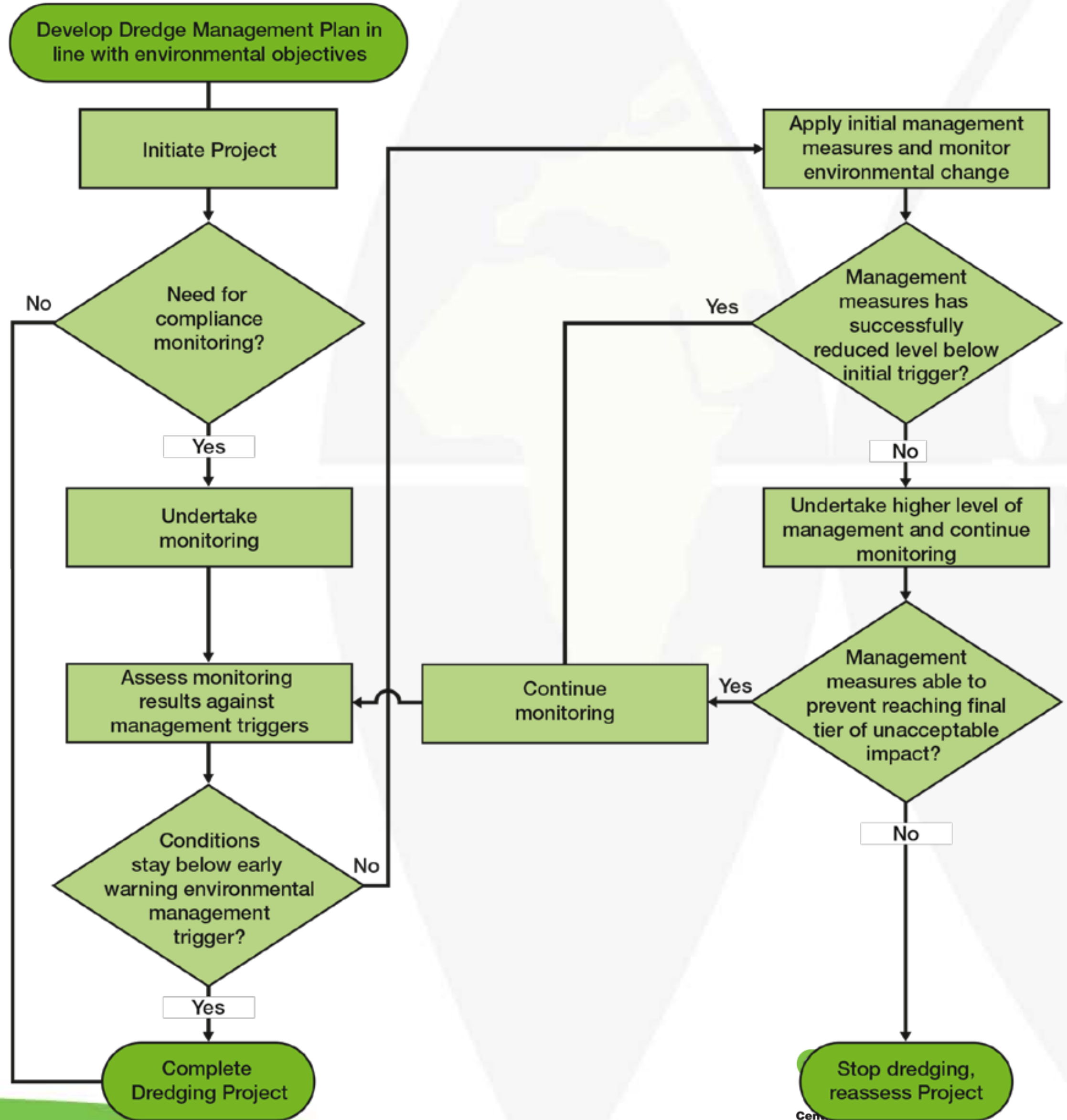
<u>Legal aspects - Permits</u>

- AM to comply with current law, possibly with combination of options.
- Uncertainty easily leads to precautionary conditions
- Role of Regulator to become more involved, if not pro-active
- Advisory Panel, with powers, could play important role in decision making, before and during implementation.
- How to objectively select Contractor for ECI when scope not yet clear.

Critical success factors for AM

<u>Adaptive Management Plan</u>

- AMP with procedure for integrating AM during implementation phase
- Simplified example given.



Critical success factors for AM (continued)

Conditions

- Understanding baseline and natural variability
- Understanding sensitivity and setting triggers
- Project-specific monitoring and analysis of data
- Project-specific management responses
- Well defined roles and responsibilities
- Effective review process

Case Studies

- Øresund Fixed Link (DK/S) – spill budget to control operations
- Wheatstone (AUS) – forecast / monitoring / hindcast of water quality
- Poplar Island (US) – Staged habitat development
- Lumut (Malaysia) – Alternative dredging and environmental protection
- Schelphoek Bay (NL) – short & long term staging of replenishment

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Main Messages

- AM efficient and cost-effective management process when objectives clear, yet local environmental effects uncertain, and management actions implemented to address uncertainties as project progresses.
- AM to desired goals by addressing uncertainty, incorporating flexibility and robustness, with new information for decision-making as the project develops.
- AM "modern" approach, potential to become good practice; underlines commitment for process optimisation. Not likely AM to become good practice for all projects, but advantages mainly for larger and multi-year projects.

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Environmental Monitoring Procedures

CEDA Information Paper
April 2015

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Chair
CEDA Environment Commission

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Monitoring Rationale – reasons:

- to characterise and gain a good **baseline** understanding of the environmental setting
- to detect and quantify changes in the environment arising from dredging
- to assess **compliance** with permit/licence/legal/contract requirements
- to calibrate and validate numerical models

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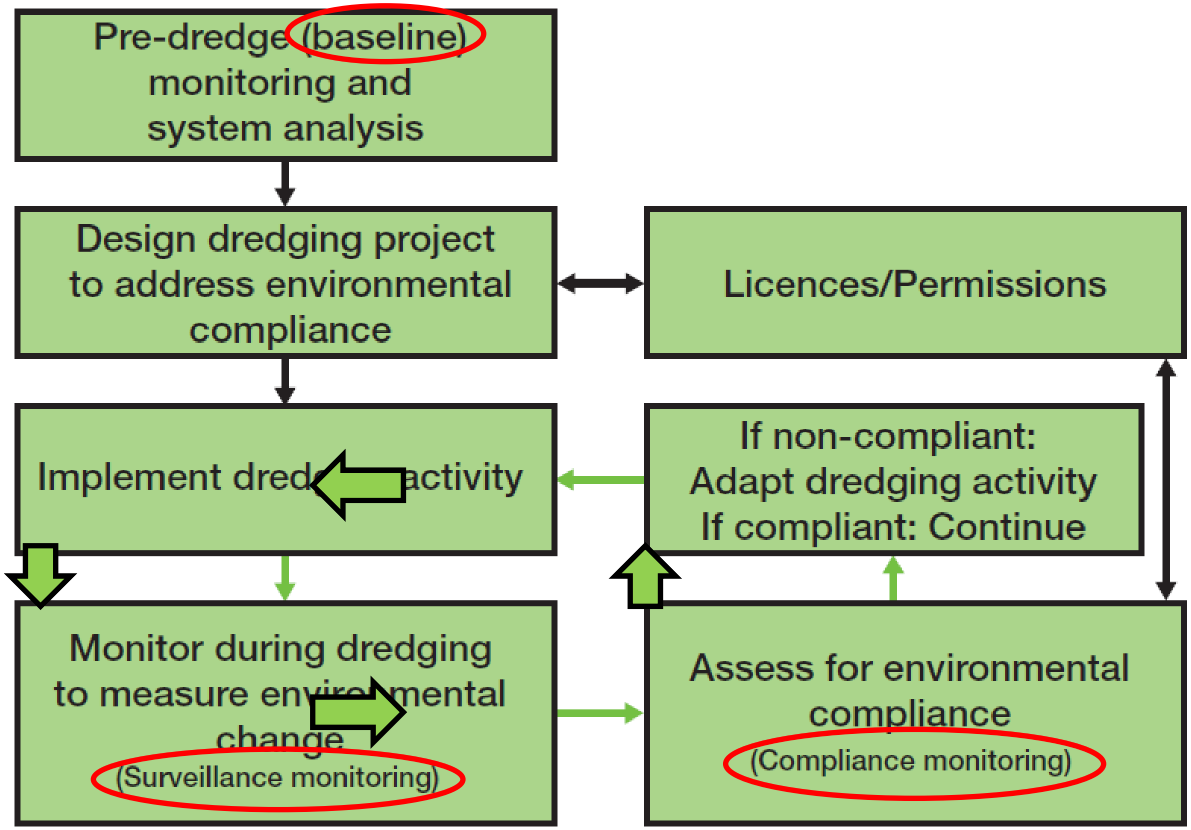
Monitoring throughout the project



Monitoring provides feedback to planning of dredge activity and support adaptive Management

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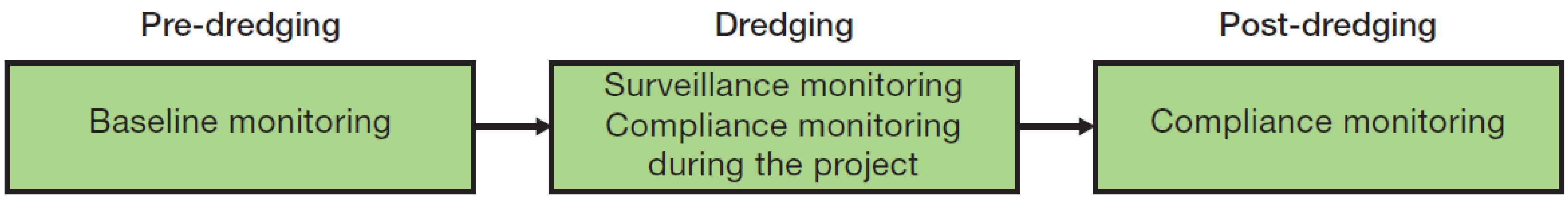
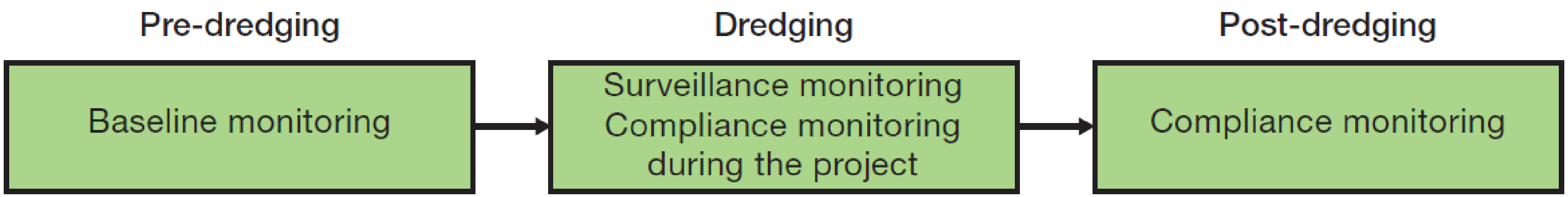
Common terminology needed



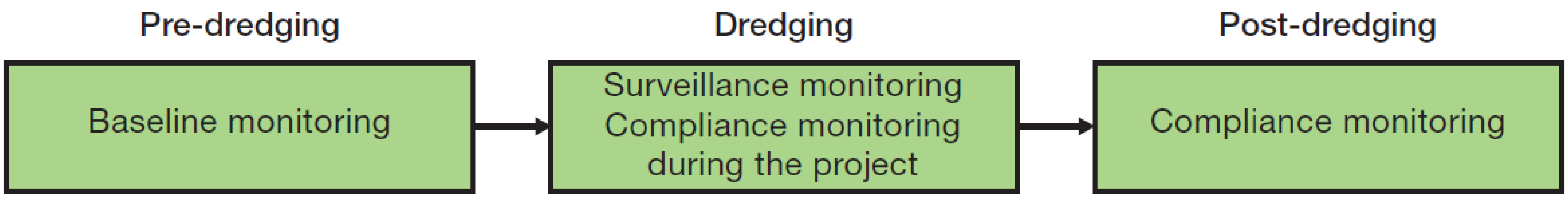
- **Baseline monitoring**: to assist with designing and planning of dredging
  - Ambient environmental conditions
  - Support to the environmental impact assessment (EIA)
  - Understanding of the actual environment
  - Natural variations
  - Starting point from where the actual impact can be measured

Common terminology needed



- **Surveillance monitoring**: to determine whether environmental changes are occurring and are acceptable
  - Monitoring during dredging
  - Compare with baseline data
  - Check if scope (frequency and/or geographical) needs to be adjusted
  - Feedback- / adaptive monitoring if implemented can be used for avoiding conflicts with permits etc.

Common terminology needed



- **Compliance monitoring**: to demonstrate whether dredging complies with requirements of environmental protection mechanisms
  - Status before the project is handed over to the owner
  - Compliance with the criteria and limitations laid down in the permits
  - Lessons learned !

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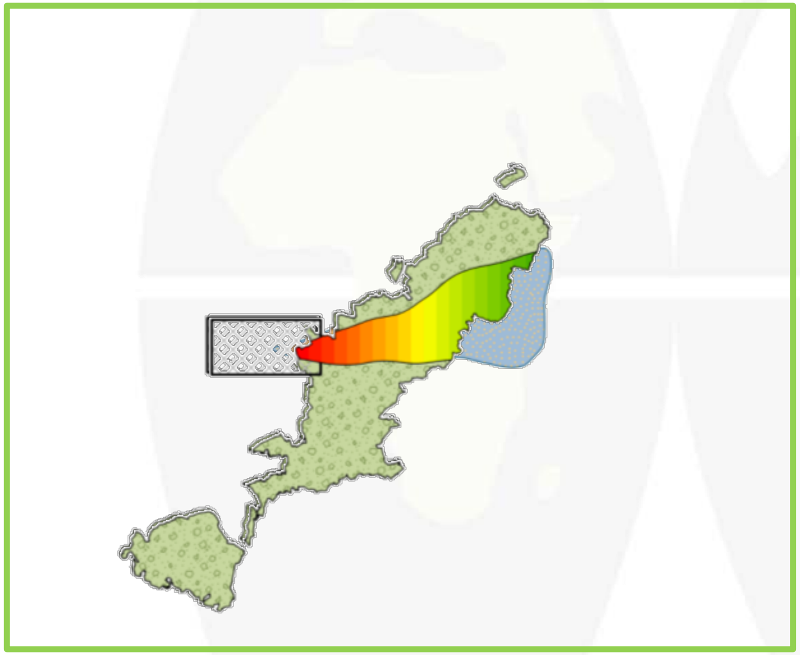
Design of monitoring program

1. Map receptors
2. Assess pathway/change
3. Assess impact
4. Assess significance



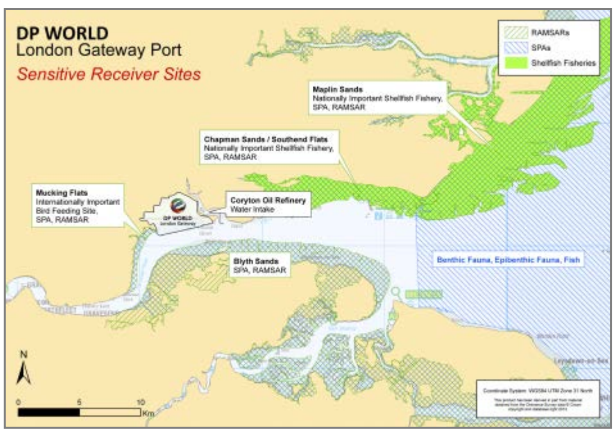
Receptors: physical, biological and anthropogenic resources

Significance of the impact: duration and/or magnitude of activity

Case studies

Schelde, Belgium/the Netherlands :
Deepening of a navigation channel through an estuary and relocation of sediment within the estuary, 15 mill m^3

Comprehensive existing baseline monitoring and system analysis: limited and targeted additional monitoring



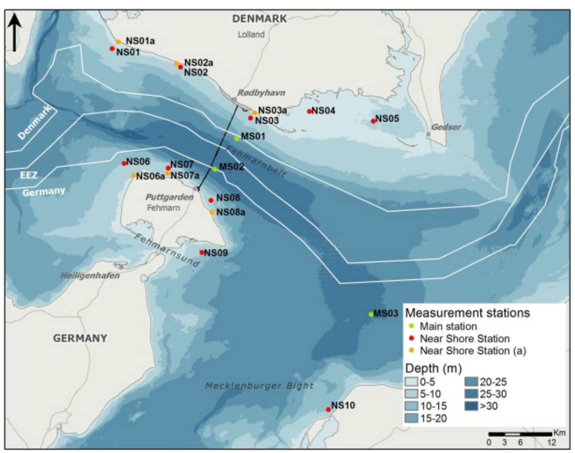
London Gateway Port, UK
A major dredging and reclamation project for port construction in the mouth of an estuary, 30 mill m^3

- Feedback monitoring/Adaptive Management
- Environmental indicators identified (SSC and DO)
- Caution thresholds and stop thresholds

Case studies

East English Channel:
Marine aggregate dredging. Coordination of monitoring and development of impact assessment for numerous sand and gravel sourcing projects within a limited area

Introduction of a Regional Environmental Assessment
Where conditions are similar: detailed monitoring in smaller areas more useful than monitoring at lower resolution



Fehmarnbelt, Denmark-Germany
Construction works for an immersed tunnel (baseline only)

Comprehensive baseline monitoring which forms input to the EIA.

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Case studies

Hudson River Superfund Site, New York, USA
Clean-up of PCB-impacted sediment in a riverine environment, 2 mio m^3 PCB impacted sediment

- Ensuring the PCB content in the water column remains below drinking water standard
- Minimise release during dredging
- Minimise transport downdrift

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Lessons learned and recommendations

- The monitoring program shall be designed to:
  - document the **natural thresholds and variability** of the environment
  - to **test the predictions of pressures and impacts** identified during the planning and EIA process
- For bigger projects, allowance shall be made for **adaptation of the monitoring program** during all phases
- Data collected during baseline and during dredging are used for calibration and validation of **predictive modelling tools**. Tools can be used with growing confidence to guide the dredging works
- Environmental **Data Management Systems** are essential to efficient and optimal use of the very expensive data collected in monitoring program before, during and after dredging.

Efficient and optimal monitoring is a prerequisite for successful Adaptive Management of dredging projects

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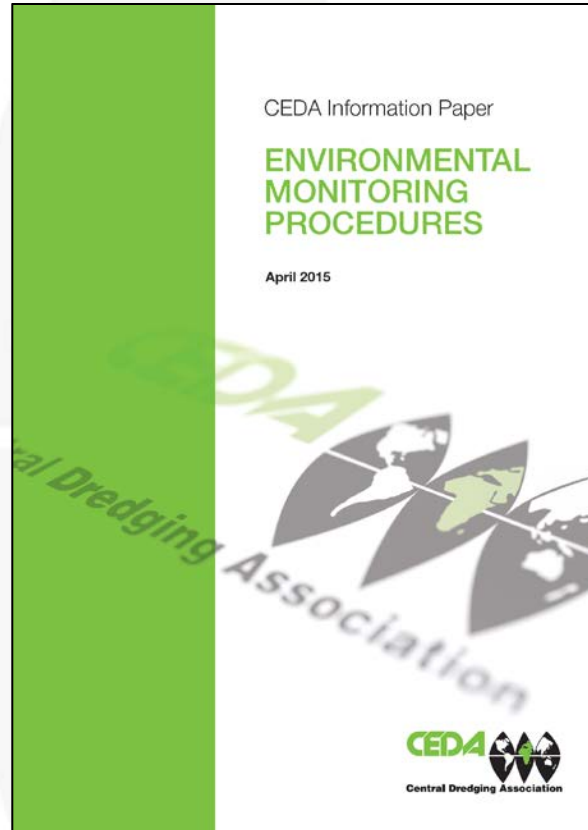
Acknowledgement

www.dredging.org



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In preparation …

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